

REMARKS

1. The Office Action has taken Applicant's provisional election in the response filed 3/31/2003, and examined claims 1-15. Claims 16-23 were cancelled. Applicants gratefully acknowledge the indication that claims 8 and 9 are objected to as being dependent upon a rejected base claim and would be allowable if rewritten in independent form. However, Applicants submit reasons in this response why independent claim 1 and its dependent claims are patentably distinguishable over the applied references and have maintained claims 1-15 in unamended form, as discussed below.

2. The single drawing was objected to because it contained Figure 1 as a label. Applicant's submit herewith a correction to the drawing, omitting the reference to Figure 1. Accordingly, reconsideration and withdrawal of the objection are respectfully requested.

3. Claims 1-7 and 10-12 were rejected under the provisions of 35 U.S.C. 103(a) as being obvious over Fukui in view of Menhennett et al. The Office Action stated Fukui taught coloring a three-dimensional polymer object with a solution containing a sublimable dye while heating at an elevated temperature above the polymer's glass transition temperature to permeate the object with the dye. Menhennett et al. was cited as teaching forming three-dimensional polymer objects by selective deposition modeling using the same materials as Fukui. It was alleged to be obvious to the method and means of Menhennett et al. to form the Fukui polymer object, with the expectation of forming a colored object. This rejection is respectfully traversed.

The application describes an invention of providing color to SFF objects via permeation of the object with a colorant. The term permeate clearly implies that the colorant completely infuses the object. The process described is a deep infiltration of the object. The colorants described on page 16, at lines 10-25 of the specification are dyes from the following classes: color index dyes, solvent dyes, disperse dyes, modified and direct dyes, and basic dyes. It is specifically recited that the colorant is soluble in the selected medium, which penetrated the build

objects. The penetration of the colorant infiltration agent was effective to colorize by permeation the internal volume of the parts, as explained on page 22, at lines 15-18.

A person of ordinary skill in the art in trying to solve this problem would not look to references that are specific to sublimable dyes. A sublimable dye is a very specific and particular dye that exists normally as a solid and when heated goes to a gas phase without ever passing through a liquid state. Sublimable dyes are used primarily in the dye sublimation process in which a solid dye, usually on a film carrier, is contacted with a polymer surface and heat is applied. The heat converts the solid dye to a gas, which then passes into the outer surface of the polymer, which has opened pores due to the heat. When the heat contact is removed the pores close and the gas reverts to a solid within the closed pores of the polymer. Sublimable dyes can also be used by being dissolved in a solvent and coated on a polymer surface. The surface is then heated to again open the pores of the polymer and the sublimable dye penetrates the outer surface pores that close upon cooling. In either process the sublimable dye penetrates only a very short distance into the polymer. This is not a permeation of the object.

The Fukui reference is specific to sublimable dye processes. Every reference to dyes in this patent is for sublimable dyes and, notably in fact, a full penetration of colorant is taught away from. Specific reference is made to column 4, beginning at line 12, "The depth of dye penetration is preferable within the range of 3~500 μ . If it is less than 3 μ no durable dye effect can be obtained, and if it is greater than ~500 μ , the dye is more liable to bleed toward the characters, etc., portion." It must be noted that throughout the reference the limiting of the depth of penetration is critical because the colorant must not bleed over into the "character" area. This is why sublimable dyes must be used, and not an infiltration process. The object is not and cannot be permeated. To use Applicants' claimed method will make Fukui, and all references using sublimable dyes, non-functional.

Applicants also specifically point out that in the specification of the instant application in Example 1 the object infiltrated by the claimed method was actually cut in half to reveal that the entire internal volume of the part was colorized. That part was 50,000 μ in the smallest dimension. The person of ordinary skill in the art trying to learn about such an infiltration process simply would not consult the Fukui reference. It is respectfully submitted that it is improper to use the Fukui reference in a 35 U.S.C. 103(a) rejection since the claimed invention destroys the

functionality of Fukui, the applied Fukui reference teaches away from the claimed invention and the invention is not obvious over the applied references. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

4. Claim 13 was rejected under the provisions of 37 U.S.C. 103(a) as being obvious over Fukui and Menhennett et al. as applied to claim 1 and further in view of Oka et al. The Office Action alleged it was obvious to substitute the alcohol solvent of Oka et al. for that of Fukui and Menhennett et al. in a sublimable dye solution to provide a desired polymer coloring. This rejection is respectfully traversed.

For the same reasons stated above it is submitted it is not proper to use the Oka et al reference in rejection of claim 13. Oka et al is clearly teaching a sublimable dye thermal transfer onto a thin substrate, not a permeation of a large object. Applicants are not using a sublimable dye and are permeating the three-dimensional object at a temperature above the glass transition temperature of the polymer component. For this reason and in combination with those stated in paragraph 3 above, reconsideration and withdrawal of the rejection are respectfully requested.

5. Claims 14-15 were rejected under the provisions of 35 U.S.C. 103(a) as being obvious over Fukui and Menhennett et al. as applied to claim 1, and further in view of KR 2002-12819 by Jang et al. ("Jang"). The Office Action alleged it was obvious to substitute the solution of Jung solution solvent (a fatty acid ester such as linseed oil) sublimable dye for that of Fukui and Menhennett et al. This rejection is respectfully traversed.

For the same reasons stated above, it is submitted that Jang is not an appropriate reference to be used against the instant invention. Jang teaches the use of a sublimable dye to dye a polyester film. The reference is silent on the thickness of the films but most commercial polyester films are less than 100 μ and are usually in the 10-20 μ range. It is submitted that this is not a reference that a person of ordinary skill in the art would look to for teachings about permeating large plastic objects with soluble dyes. For this reason and those stated with respect to the rejection in paragraph 3 above, reconsideration and withdrawal of the rejection are respectfully requested.

6. A new independent claim 24 has been added to the application incorporating the limitations of objected to, but indicated as allowable, claims 8 and 9 and those disclosed, but

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previously unclaimed, on page 16, at lines 10-11. It is submitted this claim is in condition for allowance.

7. In summary, claims 1-5 and 24 remain in the application. New independent claim 24 is presented for examination.

Pursuant to currently recommended Patent Office practice, the Examiner is expressly authorized to call the Applicant's attorney collect at Valencia, California, if in his judgment disposition of this application could be expedited or if he considers the application not ready for examination or final disposition by other than allowance.

Respectfully submitted,
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